

PULP & PAPER

February 1988

C 3975-2
2/19/88

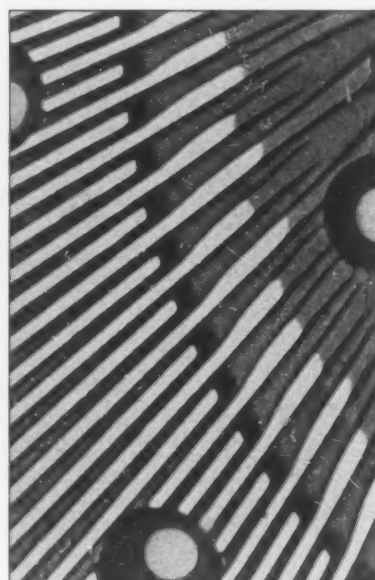
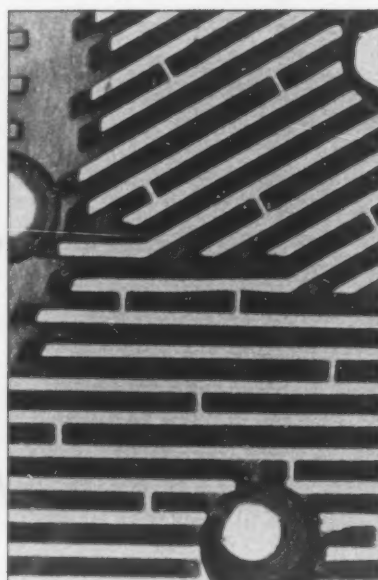
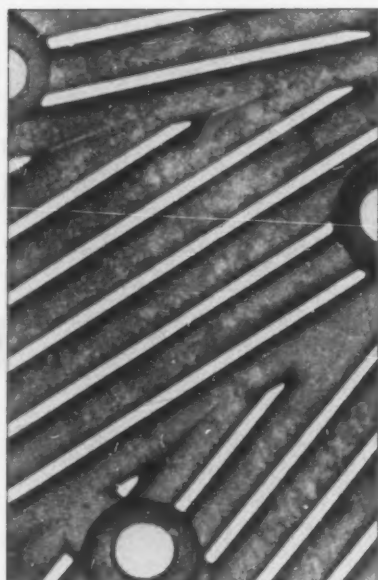
**STOCK PREPARATION/
RECYCLING:** *Newest
high-efficiency systems*
*Survey of waste-to-energy
incineration* **62**

80020814 EA 452 SEP88 07
SERVICE INC/SRI
CONGRESSIONAL INFORMATION 212
4520 EAST WEST HWY
BETHESDA MD 20814

3

EXHIBIT GUIDE '88
See page 79

FEBRUARY



FOCUS: STOCK PREP/ RECYCLING

Board machine upgrade 43

New press section on No. 3 paper machine helps increase production and quality, boost speed by 25% at Danish recycled paperboard mill

Waste incineration 62

Annual survey on waste-to-energy incineration operations shows little effect on secondary fiber supplies, but government control of wastestreams is still a concern of wastepaper users

Fine-slotted screens 117

Small, damaging contaminants in broke and stock flow systems can be removed with fine-slotted pressure screens and special screening methods

Low-consistency refining 152

When low-consistency refiner plates are being selected, knowledge of stock, refiner design, and desired refining results is necessary to minimize mill operating costs

THE COVER

Among latest developments in stock preparation/recycling are high-efficiency refiner plates. A review of this technology begins on p. 152. (Photo courtesy of Sprout-Bauer.)

EXHIBIT GUIDE '88

Industry exhibit guide 79

Special 30-page section gives details of major exhibitors' booth displays at TAPPI '88 at the World Congress Center in Atlanta, Ga., Feb. 29-Mar. 3

Index of Exhibitors 80

Exhibit Guide Showcase 83

OTHER FEATURES

MANAGEMENT

Just-in-time delivery 45

The Japanese method of production offers challenges to box makers and suppliers; success relies on close cooperation between converters, mills

PAPERMAKING

Tissue conference 115

Tissue makers look for new ways to maintain quality, hold costs as production speeds continue to rise

PULPWOOD PROCESSING

Chip thickness slicers 139

Chip thickness has been proven critical to high pulp quality; now blade performance in chip thickness slicers has been improved with new design

PULP & PAPER

EDITORIAL STAFF

Editor in Chief Ken L. Patrick	AT
Executive Editor Kenneth E. Smith	AT
Executive News Editor Willard E. Mies	SF
Senior Editor John C.W. Evans	NY
Senior News Editor Debra A. Garcia	SF
Technical Editor Michael J. Ducey	SF
News Editor Carl P. Espe	SF
News Editor Rob Galin	SF
News Editor Regina M. McGrath	SF
News Editor Noel DeKing	NY
Departments Editor Beverlee Davis	SF
Staff Editor Maude Conrad	SF
International Editors Peter Sutton	BR
John Pearson	BR
Hugh O'Brian	BR

Managing Editor Paula J. Irons	SF
Art Editor Nancy E. Bentley	SF
Copy/Production Editor Margaret L. Brown	SF
Copy/Production Editor John Mikulenska	SF
Copy/Production Editor Marta L. Dils	SF
Technical Artist Marge Collins	SF

Office locations

AT = Atlanta: 2700 Cumberland Parkway N.W., Suite 530, Atlanta, Ga. 30339; (404) 432-3186

SF = San Francisco: 500 Howard St., San Francisco, Calif. 94105; (415) 397-1881; Telex 278273

NY = New York: 370 Lexington Ave., New York, N.Y. 10017; (212) 683-9294; Telex 220442

BR = Brussels: Chaussée de Charleroi 123a, Boite 5, B-1060, Brussels, Belgium; Telex 846-24672

PUBLISHING HEADQUARTERS

San Francisco, California

Publishing Director Leigh M. Freeman
Group Publisher Leonard E. Haas
Director of Production Andrew A. Mickus
Director of Circulation Wini D. Ragus
Ad Production Coordinator Peggy A. Spear
Marketing Coordinator Dana Baker
Clerical Assistant Carol L. Parkinson

Sales and business offices
are listed on Advertisers' Index page



MILLER FREEMAN publications

Chairman of the Board.....	Lord David R. Stevens
President.....	Marshall W. Freeman
Vice President.....	Charles C. Baake
Vice President.....	Leigh M. Freeman
Vice President.....	Leonard E. Haas
Vice President.....	Barbara M. Hampson
Vice President.....	Thomas L. Kemp
Vice President.....	Wini D. Ragus
Corporate Financial Manager.....	Charles H. Benz
Secretary/Treasurer.....	Miller Freeman III
Assistant Treasurer.....	Douglas M. Denny

PULP & PAPER (ISSN 0033-4081), with which is combined *Paper Mill News*, *Paper Trade Journal* and *Pacific Pulp & Paper*, is published monthly except November when semimonthly by MILLER FREEMAN PUBLICATIONS, 500 Howard St., San Francisco, Calif. 94105. Second class postage paid at San Francisco and at additional mailing office.

POSTMASTER: Please send Form 3579 to PULP & PAPER, 500 Howard St., San Francisco, Calif. 94105.

© Copyright 1987 by
ABP Miller Freeman Publications Inc. VBA
All rights reserved.

Subscriptions & Address Change: Sent without charge in the U.S. & Canada (upon written request) to individuals in pulp, paper, and board manufacturing firms and paper converting firms. To all others there is a subscription charge of \$60.00 a year in the U.S. All subscriptions to other countries: \$80.00 a year, except Europe and Mediterranean, \$90.00 (air service included). Single copy, \$6.00, except Buyers Guide, \$30.00. Photocopies of articles and complete microform volumes available through University Microfilms International, 300 N. Zeeb Rd., Ann Arbor, Mich. 48106.

Requests, subscription orders, and address changes must show name and position or job of individual, name and location of mill, plant or office where employed, and exact business or product produced at this location.

Send subscription correspondence to:
Circulation Department, PULP & PAPER,
500 Howard St., San Francisco, Calif. 94105.

For address change, include label from recent issue.

FEBRUARY

COLUMNS

From the Editors 7
by Kenneth E. Smith
Results-oriented maintenance

Labor/Management 37
by Daniel F. Jennings
Comparable worth and the
paper industry

Chemical Report 39
by Michael Ducey
Sulfite byproducts seek
specialty markets

Quality Report 171
by Lars Ingman
The cost of quality

Career Development 173
by Roberta Bhasin
Getting along with your boss

Comment 218
by Fred D. Iannazzi
Potential liner supply from
new sources

DEPARTMENTS

Conference Calendar	41
News of People	175
Product Showcase	181
New Products	181
Product Review	187
Literature	193
Bookshelf	199
Supplier News Feature	204
Supplier News	206

SERVICES

Reader Service Index	200
Reader Service Card	202
Professional Service Directory	208
Classified Advertising	210
Advertisers Index	216

NEWS

Month in Statistics 9
U.S. paper and paperboard production
data for November

Market Report 11
More liner producers to lift prices
Stone announces hike on kraft paper
Printing and writing markets tight
Directory paper hike on tap Apr. 1

Grade Profile 13
Tissue: Producers seek relief from
rising pulp prices; volume should
remain strong through 1988

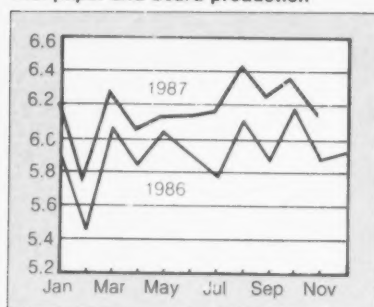
NEWS SCAN

Newsprint price hikes set	21
Bowater Mersey to lift capacity	21
BCFP to expand CTMP line	23
Cascades ramps up machine	23
U.S. ranks high in newsprint study	23
Manfor Ltd. up for sale	25
FC purchases all of Crown Forest	25
Erving Paper may sell mill	25
Korean may build paper mill	25
Cariboo to raise pulp capacity	27
API study examines dioxin levels	27
CPPA plans to study dioxin	27
IP's Corinth mill settles	29
U.S. paper spending to jump 25%	29
Freight rates to Far East hiked	29
Mills affected by rail strife	31
IP studies reactivation of mill	31
Clinch River to restart mill	31
IPC will move to Atlanta	31
Pulp capacity to grow 1.4%	33
Mead expands carbonless capacity	33

International News 35
Holmen to expand newsprint capacity
Bunzl expands distribution network
Aracruz pulp expansion progresses
Iggesund buys Thames Board of U.K.
Leykam to spend \$226 million on LWC
Machines slated in Finland, Germany
James River buys Kaysersberg
Paper and board output rose in Europe
Fletcher tries to block NZFP merger

MONTH IN STATISTICS

U.S. paper and board production



U.S. production of paper and paperboard totaled 6.1 million tons in November, a gain of 4.7% over the previous year, according to American Paper Institute figures. With just one month to go in 1987, production was expected to reach a record 74 million tons for the year, up 4.9% from 1986. The seasonally adjusted rate of paperboard production was 37.3 million tpy in November, up 5.7% from the previous year. The paper sector posted a weaker 36.7-million-tpy performance, up 4.1% from 1986.

Among major grades, uncoated freesheet took over from coated paper as the strongest growth sector in the September-November period, API reported. Newsprint and tissue continued to exhibit steady growth, while kraft packaging papers remained depressed. Unbleached kraft linerboard continued as the strongest paperboard grade, followed by recycled board. Corrugated box shipments were very strong in November, according to the Fibre Box Assn., rising 8.3% above November 1986.

Canadian newsprint shipments totaled 785,000 metric tons in November, according to the Canadian Pulp & Paper Assn., down 0.6% from the previous year. Woodpulp shipments climbed 2.7% to 683,000 tons. Operating rates stood at 98% for both grades in Nov., up from 93% in 1986.

	Latest month (000 short tons)	% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
--	----------------------------------	------------------------------	--	------------------------------

PAPER & PAPERBOARD PRODUCTION¹

Newsprint	Nov.	482	1.9	5,828	3.6
Uncoated groundwood (s)	Nov.	112	-16.4	1,505	-2.5
Coated paper (s)	Nov.	581	8.6	6,841	9.7
Uncoated free sheet (s)	Nov.	926	10.5	10,949	5.3
Other printing/writing	Nov.	110	1.9	1,379	-1.1
Total packaging and other paper (s)	Nov.	419	0.5	5,056	-1.2
Tissue	Nov.	454	7.1	5,308	4.1
Total paper	Nov.	3,083	5.3	36,866	4.1
Unbleached kraft paperboard	Nov.	1,528	4.9	18,814	6.7
Semichemical medium	Nov.	458	0.9	5,625	4.4
Bleached paperboard	Nov.	345	-0.9	4,389	2.9
Recycled paperboard	Nov.	741	7.2	8,623	6.0
Total paperboard	Nov.	3,071	4.1	37,451	5.7
Total U.S. paper and paperboard output	Nov.	6,155	4.7	74,317	4.9

PULP, WASTEPAPER & FIBER²

Total U.S. woodpulp production	Oct.	5,067	4.0	59,542	4.7
Market pulp production	Oct.	670	13.0	8,082	7.9
Wastepaper consumption at paper/board mills	Oct.	1,619	14.1	18,366	6.4
Pulpwood consumption (cords)	Oct.	7,984	2.6	94,060	3.2

CONVERTED PRODUCTS STATISTICS³

Corrugated box shipments (billion ft ²)	Nov.	23,281	8.3	274,258 ⁶	4.7
Containerboard inventories at U.S. box plants and mills	Nov. 1	2,355	8.0		

INTERNATIONAL TRADE²

U.S. paper imports (including products)	Oct.	1,099	10.1	12,486	8.0
Imports of Canadian newsprint	Oct.	710	2.9	8,629 ⁶	3.8
U.S. paper exports (including products)	Oct.	415	13.4	5,206	14.9
Exports of unbleached kraft linerboard	Oct.	168	10.5	2,231	10.3
Exports of woodpulp	Oct.	333	-3.2	4,798	7.0
Norscan pulp inventories ⁴	Nov. 30	911	-12.0		
Norscan pulp operating rates ⁴	Nov.	96%	98%	94%	98%

CANADIAN STATISTICS⁵ (reported in metric tons)

Total newsprint shipments	Nov.	785	-0.6	6,405 ⁶	5.2
Operating rates	Nov.	98%	93%	97%	93%
Inventories held by U.S. consumers	Nov. 30	1,354	7.4		
Other paper/board shipments	Nov.	539	5.7	4,221	6.2
Woodpulp shipments (export only)	Nov.	683	2.7	5,313	2.3
Operating rates	Nov.	98%	93%	97%	92%

1 American Paper Institute. 2 API, Bureau of Census, American Pulpwood Assn. 3 Fibre Box Assn., Paperboard Packaging Council. 4 North American/Scandinavian paper-grade market pulp. 5 Canadian Pulp & Paper Assn. 6 Not annualized. (s) = Shipments.

TISSUE: Producers seek relief from rising pulp prices; volume should remain strong through 1988

Grade structure: Tissue falls into two major groups: sanitary and "other." About 98% of total output is sanitary, including bathroom, facial, toweling, napkins, basestock for sanitary stock, wadding, and wipes. The "other" group includes basestock for waxing, wrapping, and miscellaneous.

The two major markets for tissue are consumer, and commercial and industrial (C&I). Consumer tissue is purchased by people at retail outlets, while industrial tissue is bought by hotels, offices, restaurants, and factories. Typical basis weights for tissue include 12 to 14 lb/3,000 ft² for single-ply bathroom tissue and 32 to 39 lb/3,000 ft² for single-ply towel.

Production/capacity: The American Paper Institute estimates that U.S. capacity for tissue paper will expand at an annual rate averaging 1.9% over the next three years to reach a total of 5.955 million tons in 1990. This is down from the previous decade's 2.2% average annual growth rate. Last year's capacity was 5.635 million tons, according to the API, while capacity in 1988 is expected to reach 5.771 million tons.

Toward the end of the first half of this year Fort Howard Corp. will start up the second recycled tissue machine (No. 17) at its Savannah River mill in Rincon, Ga. Like the first machine at the mill (No. 16), this unit will have capacity for 250 tpd. The third machine is slated to start up in late 1989. Although the installation date of the fourth machine has not been announced, Fort Howard has shown no signs of backing off from its announced plan to have four tissue machines at the mill, giving it capacity for about 1,500 tpd of tissue, towel, and napkin products for both the C&I and consumer markets. The company is also applying for permits to install a ninth tissue machine at its Green Bay, Wis., mill, but no start-up date has been announced.

James River Corp. is going to start up a 70,000-tpy tissue machine at its Wauna Div. mill in Clatskanie, Ore., toward the end of the year. The company has revised its U.S. tissue expansion plans and said it will start up two new tissue machines instead of three between 1989 and 1994. Chesapeake

Corp. is planning to spend \$148 million at its Wisconsin Tissue Mills Inc. subsidiary, Menasha, Wis., to install an 80,000-tpy twin-wire tissue machine to start up in 1990.

Despite this good news, Scott Paper Co. and James River both announced major investment plans last year geared toward cornering the faster-growing western European tissue market. Scott will spend over \$250 million over the next three years to expand its sanitary paper capacity in the region.

In a purchase it characterized as the "cornerstone for European expansion," James River bought 50% of the Kayserberg Div. of French papermaker Beghin-Say for \$243 million. Kayserberg has capacity for about 128,000 metric tons of household tissue and related products at three mills located in France.

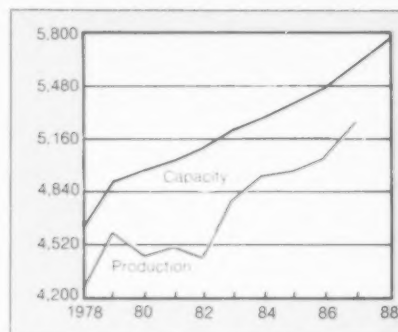
Outlook: Volume throughout 1987 remained strong and this is expected to be the case in 1988 as well. For the first nine months of 1987, annualized tissue production was running 3.8% above year-earlier levels at a rate of 5.25 million tons, the American Paper Institute reports.

1988 is shaping up to be the year in which producers of consumer tissue will finally succeed in passing on rising pulp, wastepaper, and chemical costs in the form of an across-the-board price hike. The hike will average about 5%, observers predict. Most consumer tissue prices have not been raised since 1981, although industry observers hint that tissue producers have been liberal in taking sheet count reductions.

Producers of C&I tissue implemented an across the board price increase averaging 5% effective November 1987. This followed a successful 6% price increase led by Fort Howard last spring.

Prices: Price trends tracked by Bureau of Labor Statistics' producer price index for converted sanitary paper and health products are as follows (year-end, 1967 = 100): 1980, 325.1; 1981, 347.4; 1982, 353.7; 1983, 361.2; 1984, 365.6; 1985, 377.2; 1986, 382.2; 1987 (third quarter), 386.6. (For historical data see P&P PriceBook 2.) ■

SUPPLY/DEMAND (000 tons)



FORECAST (000 tons)

	1986	1987e	1988e
Production	5,095	5,279	5,338
Capacity ¹	5,472	5,635	5,771
Utilization rate	93.1%	93.7%	92.5%
Imports ²	66	55	50
Exports ²	17	36	38
Apparent U.S. consumption	5,144	5,298	5,350
lb/capita	42.7	43.6	43.6
GNP ratio	1.39	1.39	1.39

e = P & P estimate.

1. American Paper Institute data.

2. U.S. Dept. of Commerce data.

TOP U.S. PRODUCERS (000 tpy)

	Annual capacity	Market share (%)
1. Scott Paper	1,050	18.2
2. James River	1,041	18.0
3. Procter & Gamble	900	15.6
4. Fort Howard	895	15.5
5. Georgia-Pacific	540	9.4
6. Kimberly-Clark	430	7.5
7. Erving Paper Mills ¹	150	2.6
8. Pope & Talbot	148	2.6
9. Chesapeake	120	2.1
10. APL Corp.	95	1.6

Market share of top five companies:
71.5%

Market share of top ten companies:
93.0%

Total U.S. capacity (1988):
5.771 million tons

¹ Sale of Lockland, Ohio, mill pending.

power needs of the expanded facility, which will therefore make Bowater Mersey the largest consumer of electrical power in the province, it was recently noted.

Conversion to all TMP will enable the mill to make better use of the available wood supply, the company reported. Currently, spruce and fir primarily are used. With 100% TMP production, the mill will be able to use some hemlock, pine, and hardwoods. The province has guaranteed the availability of adequate wood supplies, it was noted.

The project will also entail improvements to the woodyard and the woodroom, newsprint storage, and shipping facilities.

In 1985, Bowater Mersey worked out an agreement with the local municipality protecting the company from a local tax increase based on capital improvement expenditures. "Our taxes were significantly higher than those of other mills in Atlantic Canada, and the agreement will help to bring them in line," noted Anthony P. Gammie, Bowater chairman and CEO. ■

BCFP to spend C\$32 million expanding CTMP line

British Columbia Forest Products Ltd. said excavation work has begun on a C\$32-million expansion of its chemithermomechanical pulp (CTMP) mill in Crofton, B.C. The expansion is expected to raise CTMP capacity to 555 metric tpd from 320 tpd, thus enabling the mill to supply all of its fiber requirements for newsprint production. Startup is scheduled for the fall of 1988.

BCFP said the project was undertaken as a result of 50%-owned Finlay Forest Industries Ltd.'s decision to integrate its market pulp mill with a new machine that is expected to start up in March 1989. Replacement of the refiner mechanical pulp that is currently being supplied to the Crofton operation from Finlay's Mackenzie, B.C., mill will result in "substantial costs savings" for BCFP, the company said.

The Crofton mill project includes expansion of the chip handling system and addition of a third refiner line and a second reject refining system. Sprout-Bauer Co. will supply the refiner system, including the chip washing and interconnecting screw

conveyors and impregnators. Canadian General Electric Co. will supply the refiner motors. Chip thickness screening will be supplied by Rader Companies Inc. Hooper Corp. will supply primary screening and a hydraulic reclaimer. A disc filter is scheduled to be delivered from Cellico Inc. ■

Cascades ramps up recycled news machine at Niagara

Cascades Niagara Falls Inc. started up a 30,000- to 35,000-short-tpy recycled newsprint machine Jan. 8 at the former Nitec Paper Corp. mill in Niagara Falls, N.Y. No. 2 corrugating medium machine will come online in February, a spokesman said. No. 2 has a similar capacity rating. The company had earlier indicated that both ma-

chines would manufacture recycled containerboard.

Richard Joncas, who was appointed mill general manager in August, said that No. 1 machine will use 100% recycled fiber to manufacture newsprint. Joncas added that the machine is capable of making linerboard as well.

No. 1 machine previously was used for making lightweight coated paper. Cascades rebuilt the wet end systems, including a new Voith headbox. The project supervisor was Le Perriere & Verrault of Trois Rivières, Que., overseer of the reconstruction of the company's Rockingham, N.C., tissue mill in 1984. More work is planned for the Niagara mill, Joncas said.

Both machines are expected to be running at full capacity by the beginning of the second quarter. ■

U.S. is the best place to make newsprint

In a recent Canadian government study comparing newsprint manufacturing costs in the world's top five producing regions, Norway ranks as the most competitive during the period from 1983 through 1986. However, a shift in currency exchange rates since 1986 has swung the cost advantage in favor of the U.S.

The report, called "Newsprint Cost Study, 1982-1986," shows that the production cost per finished ton of newsprint on a delivered basis is currently lowest for U.S. producers in both the West and the South using current exchange rates. Finland ranks the highest, while Norway comes in third. In 1986 Norway was the low-cost producer, while Finland and Sweden had the highest costs.

The findings, done by Price Water-

house for the Forest Sector Advisory Council's newsprint subcommittee, update an earlier report prepared for the years 1982 and 1983. FSAC is an advisory body to the Canadian federal government. The newsprint-producing regions covered in the study include Canada, the western U.S., the southern U.S., Finland, Sweden, and Norway.

Comparing the major cost items of each region in 1986, Norway has the lowest cost of energy. Labor cost is lowest in Finland. The U.S. South has the lowest costs for furnish material and delivery. That same year, the average annual capacity per machine ranged from a low of 96,000 metric tons in Canada to a high of 170,000 tons in Finland.

Canada and the U.S. improved

Newsprint costs 1986 (U.S.\$/metric ton).

	Canada	U.S. West	U.S. South	Finland	Sweden	Norway
Furnish material	\$112	\$129	\$ 93	\$176	\$156	\$132
Energy	56	75	75	87	79	35
Labor	82	54	67	38	60	53
Other	49	56	80	45	62	45
Mill level cost	299	314	315	346	357	265
Corp./selling cost	20	9	16	24	17	12
Cost before delivery	319	323	331	370	374	277
Delivery	62	45	28	70	55	67
Total delivered cost	\$381	\$368	\$359	\$440	\$429	\$344

Source: Forest Sector Advisory Council of Canada, "Newsprint Cost Study, 1982-86."

their rankings as the Nordic countries declined in 1986 largely due to the effect of the currency exchange adding about \$100 to the delivered cost per ton of newsprint produced in the Nordic countries.

The greatest swing in the rankings from 1982 to 1986 occurred for the U.S. South, which was the lowest in 1982, the second highest in 1985, the second lowest in 1986 (and the lowest in 1987, based on year-end exchange rates). These swings were related to labor unrest in 1983 and startup costs in 1984 and 1985.

Significant changes in exchange rates have dramatically altered the Nordic countries' rankings, the study notes. In 1985 Norway, Sweden, and Finland were the three lowest cost producers. In 1986, Sweden and Finland ranked fifth and sixth overall, while Norway's cost advantage was substantially reduced. At the same time, Canada's ranking as number four also largely resulted from shifts in currency exchange rates. ■

ACQUISITIONS/MERGERS

Manfor Ltd. up for sale; province seeks investment

Government officials of the Canadian province of Manitoba confirmed they are again interested in selling Manfor Ltd. and are seeking a buyer to invest additional capital to ensure the long-term competitiveness of the 400-metric-ton unbleached kraft pulp and paper mill in The Pas, Man.

Unlike prior attempts to sell the mill, the Manitoba government now feels more confident of a divestiture. "Manfor's circumstances have improved remarkably in the last couple of years, financially and otherwise. It is certainly not a question of a fire sale," said Jerry Storie, minister responsible for Manfor. In this latest attempt to sell the mill, the province has added conditions that will have to be met prior to any transfer of ownership. These additional conditions include "additional investment, diversification of the product, best use of the resources, as well as maintaining or increasing the employment levels," said Storie.

Manfor, the largest Canadian producer of unbleached kraft paper, has been owned by the Manitoba government since 1973 after being placed in

receivership. Although it had been on the block before, the mill's history of operating losses since its inception in 1969 has discouraged investors. In 1987, however, the mill was expected to have made CS10 million and may earn even more in 1988 thanks to stronger prices for kraft paper. This follows losses of CS5.3 million in 1986 and CS31.3 million in 1985.

The province reopened discussions on selling the mill again this past spring, Storie noted. So far, seven Canadian companies have looked at the mill and have been asked to submit proposals to the province. No provincial financial assistance is being offered, although some of the investors have indicated they would seek federal aid. Among the companies interested in Manfor are Kruger Inc., Repap Enterprises Corp., West Fraser Mills Ltd., and Weyerhaeuser Co. Off-shore investors have also made inquiries, said Storie. Some potential buyers are probably considering the eventual conversion of the mill to bleached pulp and paper grades.

The mill has one single 246-in.-width Dominion Engineering fourdrinier machine equipped with a Flakt dryer. A new press section was added in 1985 as part of a CS40-million modernization. It is the only mill in North America that can produce air-dried multiwall sack paper. ■

FC purchases all of Crown Forest, ups control of BCFP

Fletcher Challenge Ltd. of New Zealand now owns 100% of the stock of Crown Forest Industries Ltd. In December Fletcher acquired the 4% of Crown's Class A common shares that it did not already own for CS80/share or CS32 million.

Fletcher Challenge also increased its holding in British Columbia Forest Products Ltd. from 48% to 67.4% in a CS19/share stock offering that ended Dec. 22. When FC made the offer in November, it said it wanted to increase its ownership beyond 50%. Industry observers are convinced that FC will make a bid to purchase the rest of BCFP's shares when market conditions are right. If it succeeds in acquiring the remaining shares, FC is almost sure to merge Crown Forest with BCFP, creating a forest products company with over \$2 billion in assets, according to the *Globe & Mail*.

This scenario will require FC to

placate the directors of BCFP, who felt that the latest tender offer did not reflect the value of the company and urged shareholders not to sell. ■

Erving Paper may sell Ohio tissue mill to workers

Erving Paper Mills and the employees of the company's Fox Paper Div. in Lockland, Ohio, are negotiating an employee buyout of the division. The Lockland mill has capacity for about 100 tpd of napkins, facial tissue, crepe paper, kraft paper, and bag paper. It currently employs about 120 people. The buyout is expected to be completed during the first quarter. The employees said they will try to diversify the mill's product line by producing higher-basis weight paper, among other things. Erving announced last fall that it intended to close the mill. ■

EXPANSIONS

Korean may build recycled paper mill in Missouri

The Chamber of Commerce of St. Joseph, Mo., has signed a letter of intent with Rep. Korean businessman Hwa-jin Yu for the construction of a recycled paper mill, to be called Mi Ho Paper Co., that is estimated to cost at least \$41 million. Yu owns two paper companies in Korea, Mi Ho Paper Co. Ltd. and Hwa-jin Paper Co. Ltd. Yu plans to supply \$9 million of the capital that is required for startup, with the balance of the financial package being arranged by the Chamber of Commerce.

Yu is still deciding what the product mix of the mill will be, but a spokesman at the Chamber of Commerce said most of the advanced purchase orders Yu has received are for fine coated paper, in which case the mill would presumably have to buy some pulp. The mill might also make recycled boxboard. About 70% of the mill's product will be exported to Rep. Korea, and the rest will be sold domestically. The mill is expected to employ between 150 and 200 people.

Mi Ho will purchase wastepaper within a 500-mile radius of St. Joseph. Wastepaper dealers are eager for the mill to start up since there are no big waste-based mills in the area and this would create a new market. ■

FORECAST

Pulp capacity to grow 1.4%, FAO predicts

Worldwide capacity for paper-grade woodpulp is projected to increase by 1.4% annually from 1986 to 1991, reaching 154.6 million metric tons, according to the United Nations' Food & Agriculture Organization's most recent *Pulp and Paper Capacities* survey. Total paper and board capacity is expected to grow 1.9% during the period to 248.1 million tons.

Both of these growth rates are

slower than those during the 1981-86 period, when woodpulp capacity increased 1.7% and paper and board capacity grew 2.2%. (It should be noted that capacity figures for the U.S.S.R. remained unchanged from the 1985-90 survey, which presumably does not reflect reality.)

In 1986, capacity for paper-grade woodpulp was estimated at 154.4 million tons, an average annual rise of

1.7% from 1981. Capacity is to increase by 11.3 million tons by 1991—a 1.4% annual rise. Capacity for paper and board in 1986 was 226.2 million tons, an average annual increase of 2.2% from 1981. By 1991 this is to increase by 21.9 million tons to 248.1 million tons.

The fastest growth in paper and paperboard capacity over the next five years is expected to occur in the developing countries of Africa, Latin America, and Asia, which will see capacity growth of 2.5% annually. This is a decline from the 5.3% growth rate that these areas enjoyed from 1981 through 1986. The centrally planned economies are expected to be a close second with a growth rate of 2.1% over the next five years. This group is the only one of the three that is expected to grow at a faster rate than the 1981-86 period.

The developed countries will account for 76.2% of total paper and paperboard capacity in 1991, which is the same amount forecast in the FAO's previous survey. Developing countries are expected to have 10.2% of the paper and board capacity in 1981, while centrally planned economies will account for 13.6%. ■

FAO forecasts for world pulp and paper capacity.

World woodpulp capacity, 1986-91

	Capacity (000 metric tons)		Annual average increase	
	1986	1991	1981-86	1986-91
World total	154,353	165,637	1.7%	1.4%
Developed economies	125,870	133,814	1.4	1.2
North America	76,700	79,668	1.5	0.8
Japan	12,268	13,144	-0.1	1.4
Western Europe	32,744	36,662	1.3	2.3
Oceania	2,708	2,890	3.7	1.3
Others	1,450	1,450	14.8	—
Developing economies	9,625	12,161	5.2	4.8
Africa	853	1,009	12.5	3.4
Latin America	6,528	8,612	3.7	5.7
Asia	2,244	2,540	7.3	2.5
Centrally planned economies	18,858	19,662	1.5	0.8
Asia	2,423	3,166	-2.8	5.5
Eastern Europe	4,385	4,446	2.5	0.3
U.S.S.R.	12,050	12,050	2.1	—

World paper and paperboard capacity, 1986-91

	Capacity (000 metric tons)		Annual average increase	
	1986	1991	1981-86	1986-91
World total	226,226	248,135	2.2%	1.9%
Developed economies	173,552	189,165	2.0	1.7
North America	85,702	91,550	2.2	1.9
Japan	24,617	26,771	1.8	1.7
Western Europe	58,209	65,343	2.2	2.3
Oceania	3,038	3,455	4.7	2.6
Others	1,986	2,046	6.1	0.6
Developing economies	22,382	25,302	5.3	2.5
Africa	1,064	1,177	6.6	2.0
Latin America	12,483	14,007	4.8	2.3
Asia	8,835	10,118	5.3	2.5
Centrally planned economies	30,292	33,668	1.4	2.1
Asia	9,607	12,534	0.3	5.5
Eastern Europe	6,685	7,134	1.4	1.3
U.S.S.R.	14,000	14,000	2.3	—

Source: FAO Pulp & Paper Capacities 1986-1991

CONVERTED PRODUCTS

Mead expands carbonless capacity by 20%

Mead Corp. will expand its carbonless paper capacity by 20% with the announced acquisition of the Indianapolis, Ind., carbonless coating facility of Standard Register Co. Mead currently produces 150,000 tons of carbonless copy paper at its Chillicothe, Ohio, plant. Indianapolis is capable of producing 30,000 tpy.

"We think that we've outgrown the market," said Jerome F. Tatar, president of Mead's Fine Paper Div. "We've always produced our carbonless in Chillicothe, and we've started to reach some limitations as to how we could get additional capacity in that facility." "This is our first offsite expansion of carbonless, and it gives us the flexibility for future expansions," said Mead spokesman, Tom Hausman. Tatar added that Indianapolis may be able to accommodate up to three or four coaters. Mead will add some rewinders and some warehousing space to take better advantage of current capacity. ■

JUST-IN-TIME DELIVERY PLAN PRESENTS CHALLENGES TO BOX MAKERS, SUPPLIERS

New production method from Japan offers many advantages but will require close cooperation between converters and mills

By JAMES F. STEVENSON

Just-in-time delivery of a product to a customer is a concept that seeks to control work-in-process inventory by keeping just as much of an item on hand as will be needed in the immediate future.

Initially used with great success in the Japanese automotive industry, its use has spread to other industries and countries, including the U.S. But American managers, who first latched onto Japanese-style, just-in-time production methods as a panacea for all of their manufacturing woes, soon found that making the cure work was tougher than expected. The just-in-time regimen calls for reducing the number of suppliers, renegotiating supplier contracts, and tinkering with plant layouts. But people also have to change their basic attitudes—managers as well as workers. The men and women in charge have to abandon the security blanket that inventory often represents and learn to trust their suppliers as never before.

As perfected by Japanese companies like Toyota, just-in-time delivery is an exacting discipline. Its basic premise is that parts and raw materials should arrive at the factory just as they are needed in the manufacturing process. This eliminates inventories and the costs of carrying them. But it can also result in additional costs for the box maker in terms of both waste and productivity.

A NIGHTMARE FOR SUPPLIERS? Too often, however, the manufacturer's dream of reduced costs turns out to be a nightmare for suppliers. They must ensure that materials get to the plant at the right time and, in some cases, that different parts, sizes, and colors arrive in precisely the right sequence for assembly. Even more taxing, suppliers must deliver materials of uniformly high quality. With just-in-time delivery, there is no backup

inventory to dip into if a newly arrived part is defective.

The most common, and most harmful, mistake U.S. companies have made has been their attitude toward just-in-time delivery. Some companies treat it as a way of getting suppliers to hold inventories for them. Manufacturers who take this approach typically leave it to their suppliers to decide how to deliver materials "just in time," usually under the threat of losing the manufacturer's business if the supplier doesn't comply.

For the just-in-time method to work, however, suppliers need a lot of handholding from their customers. They need plenty of advance notice of what and how much to make, and customers must stick to their schedules. When customers help suppliers get on a just-in-time footing with their suppliers, inventories disappear throughout the manufacturing chain, along with their carrying costs.

If, on the other hand, inventory is simply pushed down to someone else in the chain, the cost of carrying it is eventually pushed back onto the customer.

SUCCESS STORIES. The U.S. companies that have enjoyed the greatest success with just-in-time delivery typically went through an arduous learning process beforehand. Xerox Corp., for example, pulled a classic "boner" with suppliers when it first attempted to involve its copier division in just-in-time manufacturing three years ago. The company, which owned most of the U.S. copier market in the early 1970s, had lost more than half of its copier business by the early 1980s to cheaper, better-quality Japanese machines. It then began a rigorous program to improve quality and to win back market share. It slashed its number of suppliers from more than 5,000 to just 300. It gave the survivors two- and three-year contracts—long-term contracts by the standards of

TABLE 1: What "just-in-time" is not.

- A transfer of inventory from box user to box producer
- An easy way out
- Self-supporting in its own right
- C.A.P. ("call and pray") or J.I.C. ("just-in-case")

Stevenson is president of SAS International Inc., a Cincinnati, Ohio-based consulting firm specializing in the containerboard/corrugated box industry. This article is adapted from a presentation to the April 1987 Fiber Box Assn. conference.

the copier industry—in return for big improvements in the quality of parts delivered.

But Xerox ran into trouble because of its attitude. From the beginning, the company viewed just-in-time delivery as an inventory reduction program for its own benefit, asking suppliers to hold inventories without compensation. As a result, Xerox's supplier relationships, which had been carefully nurtured over the years, quickly came under strain. Xerox and its suppliers won't discuss the details of the rift, but the lesson Xerox learned was loud and clear: There is no free lunch.

A couple of years ago, Xerox began working to improve its relationships with suppliers. It began reorganizing production, firming up order schedules so that suppliers could make better plans. It also organized classes on just-in-time production to help suppliers train their employees. Today, some Xerox suppliers can't say enough good things about the company.

Another example is Harley Davidson, the only remaining U.S. motorcycle manufacturer. Harley found that Japanese manufacturing techniques were yielding 30% lower operating costs than its own. The U.S. manufacturer attributed most of this difference to three Japanese practices:

- Quality circles
- Use of statistical process controls to ensure high quality
- Just-in-time manufacturing.

The company began to imitate the Japanese in all three areas. It initially made a number of mistakes in establishing new relationships with suppliers, but then it learned from those mistakes. Teams of its buyers and engineers fanned out to visit suppliers; they began simplifying and improving designs and helping suppliers reduce setup time between jobs by modifying equipment to permit quick die changes. To improve the quality of parts, Harley gave its suppliers' employees courses in statistics to help them chart small changes in equipment performance. This practice alerts operators when machines begin to drift out of tolerance.

So far, the results for Harley and its suppliers have been good, although the company has not achieved all of its goals. Thanks to improvements in the quality of its machines, as well as vastly improved manufacturing techniques, its tab for warranty repairs, scrap, and the reworking of parts has been reduced by 60%.

CORRUGATED APPLICATIONS. The examples above do not describe corrugated applications, but the basic principles and requirements are the same. When properly implemented, just-in-time delivery provides a number of benefits to customers. Perhaps the greatest is reduction of their work-in-process inventories, which provides the following advantages:

- Less need for working capital
- Less need for storage space

- Shorter supply lines
- Less labor cost to warehouse inventory
- Less damage, pilferage, and tampering
- Bypassing of intermediate warehousing
- Quicker detection of an out-of-control process.

Because of the attractiveness of these benefits, efforts are quickly growing to apply the just-in-time concept to the corrugated industry, and the concept will likely take hold. From a box maker's viewpoint, however, this is not an easily implemented concept because it requires major changes by both the box maker and the box customer. These include:

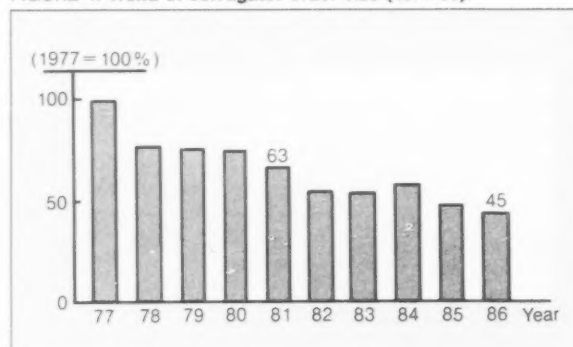
- True commitments by both managements
- Greater quality consistency
- Reliable production, shipping, and delivery
- Quicker response times
- Greater discipline in customer ordering and unloading of delivered products
- Abandoning backup inventories
- Improving communications
- Greater scheduling flexibility
- Ability to make setups cost-effectively
- Greater operator involvement.

INDUSTRY TRENDS/METHODS. The remainder of this article is based on a sampling of what is going on in the U.S. corrugated industry, which already is living with short lead times between order receipt and product delivery. However, we also have had some discussions with European and Japanese corrugated manufacturers and have discovered a growing use of the just-in-time concept there as well.

More and more box users are demanding just-in-time delivery of all material supplies, including packaging materials. Inherent in this policy is the goal of reducing in-plant inventories. Box makers are making use of several methods to meet these demands, including:

1. Moving inventory back to the box plant
2. Moving inventory to an outside warehouse closer to the customer's plant
3. Using options 1 or 2, but with reduced quantities.

FIGURE 1: Trend of corrugator order size (1977-86).



by accepting shorter runs

4. Minimizing the need for backup inventory through effective quality and process control.

These options are listed in order of increasing difficulty but also of increasing payoff.

But just-in-time delivery is not a stand-alone system. It is a value-added service that simply will not work unless the box plant reliably produces and delivers a quality product. The most common way of ensuring this is implementation of statistical quality control (SQC) and statistical process control (SPC) procedures.

Once these procedures are functioning properly, just-in-time delivery is a natural next step. However, it still imposes some cost burdens on the box plant, even if the plant is equipped to run short orders in a cost-effective manner. The continuous-run corrugators, shorter setup times, and one-step converting operations that have been developed over the past decade partially offset these costs for manufacturers who have invested in these new technologies.

The Japanese corrugated industry was in a good position to implement the just-in-time concept because it was already required to deliver exact quantities of each order (i.e., zero overrun or underrun tolerances). Consequently, every order was run on the corrugator by itself and lineal waste was rigidly controlled. This is a primary reason for Japan's leadership in the development of

the continuous-run corrugator.

With self trimming and continuous run, it becomes economical to run each order on the corrugator as it is needed, thus cutting down on work-in-process inventories. This shortens supply lines and response times, key requirements of the just-in-time concept.

A presentation was made at the January 1987 ICCA session in Australia on the reductions in order size caused by just-in-time delivery in Japan. It noted a significant decline in corrugator order size over the last ten years (Figure 1) and an even more rapid decline in converting order size (Figure 2). These changes are reflected in large increases, in the last three years, in box orders of 500 boxes or less. Such increases came entirely at the expense of orders of more than 1,000 boxes (Figure 3). Finally, the presentation noted the short lead times that now exist in Japan. Only 40% of all orders have lead times of more than three days (Figure 4).

However, the presentation also showed that Japanese box manufacturers have not been able to overcome the negative effect of just-in-time delivery on production costs. FFG productivity is down 32%, and increases in waste, ink, and delivery costs are also evident.

An opposite approach is taken in some European box plants with 98-in. (2.5-m) corrugators and triple knives. Frequently, orders running on the second and third knives are not needed until days later. Thus, inventories build up in the supply system, counter to just-in-time principles.

One European box manufacturer's approach to just-in-time delivery involves a major capital investment designed to ensure short setup times and reliable production performance. It also involves computer monitoring of the production process and provides the flexibility needed for last-minute scheduling changes. The system also requires faster, more reliable delivery of a quality containerboard.

Also in Europe, a significant decline in the number of pieces per order for flexo folder gluers and platen die

FIGURE 2: Trend of converting order size (1977-86).

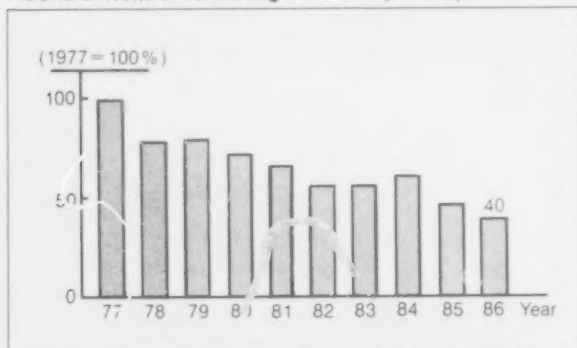


FIGURE 3: Recent trend of box order size (1984-86).

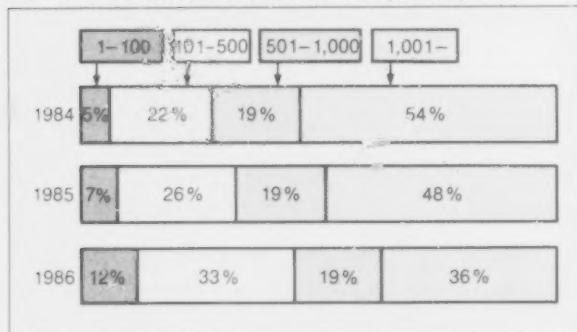
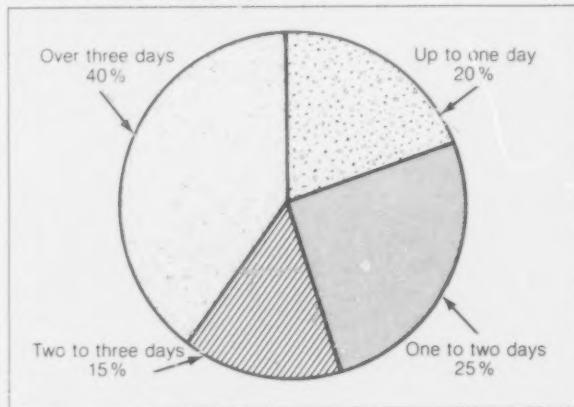


FIGURE 4: Lead time in 1986.



cutters was evident in Scandinavia in the first half of the 1980s (Table 2).

We can look for similar trends in the U.S., although only limited information is now available on actual applications of the just-in-time concept in the U.S. corrugated box industry. The most publicized example is that of Eastman Kodak, Rochester, N.Y.

NEED FOR SQC/SPC. One American box plant we are familiar with made the mistake of trying to provide just-in-time delivery without having its process under control. The result was pure disaster.

The box manufacturer tried to sort out bad quality, which caused waste to go way up. Even so, an unacceptable level of defective boxes still were being delivered to the user. To protect the user, the box maker also started carrying safety inventories in its own plant. All to no avail—the box maker lost the account.

This story reaffirms the importance of having effective SQC and SPC procedures in place before adopting just-in-time delivery.

Just-in-time delivery is being demanded by many box users, especially large-volume users with high-speed packaging lines and automatic box forming/closing lines. It generally involves two steps:

1. Reducing the number of suppliers
2. Buying only from suppliers who have an ongoing, effective SQC/SPC program.

Nearly every major integrated U.S. box maker is now involved in SQC/SPC. Most see it as an absolutely necessary step for long-term survival, and many have made use of the basic training programs offered by Philip B. Crosby of PCA Inc., Winter Park, Fla., and the W. Edward Demings Institute for Quality & Productivity at the Univ. of Miami.

Both programs make use of simple statistical procedures to monitor product quality and the manufacturing process. Both place quality control in the hands of the individual machine operator. And both have a proven track record of providing quality assurance.

BROAD APPLICATIONS. To date, efforts to apply just-in-time principles to the corrugated industry have concentrated on finished box inventories. But the amount of inventory and capital tied up in roll stock inventories

is much larger. Under normal circumstances, historical roll stock inventory levels in the U.S. have been $6 (\pm 2)$ weeks of consumption. Based on 1986 consumption rates and a price of \$350/ton, the value of this inventory is \$847 million, or \$1.3 million/corrugator.

However, a number of box plants now run successfully with less than four weeks of roll stock, and we know of one plant that runs with less than four days. If the standard six-week level could be reduced to four weeks, this would free up \$434,000 of working capital per corrugator, which could then be employed elsewhere. In addition, at a conservative cost of 10% annually for capital, storage space, and damage, this could reduce annual costs by \$43,000/corrugator.

Without changes in present practices, some increases in operating costs would also result from reducing containerboard inventory, primarily due to increased side trim and upgrading costs. However, these costs can be reduced, if not completely eliminated, by intelligently reducing the number of roll widths. This will increase the percentage of side trim, but it will also increase width utilization and reduce frequency of wet end changes, resulting in increased productivity. This increase is frequently enough to offset increased side trim costs. (In Europe, it is common to use one to three widths, compared with six to ten in the U.S.)

One of the primary reasons for carrying six weeks' inventory is the current lack of a just-in-time philosophy at containerboard mills. Most mills run a given grade about once a month, and box plants must adjust their orders and inventories to fit this schedule. Add transport time from mills to box plants, plus a little safety stock, and you arrive at six weeks.

At the same time, mills are involved in numerous trades—trades that make overall economic sense and thus should be preserved. Such trades also have the potential to help reduce lead times. This assumes a logical scheduling sequence of different weights and grades among trading partners, so that any one grade is always being run in one or more mills. Thus, one supplier's grade cycle could begin on the first of the month, a second supplier's at mid-month. This would reduce ordering lead time and inventories by two weeks.

Should this be attempted? We urge you to give it serious consideration.

Another step toward just-in-time delivery of containerboard would be for mills to maintain warehouses in large consuming areas. Some are doing this already, particularly for their independent customers. And many mills supplying Japan and Europe have found it necessary to establish warehouses to serve these markets.

We believe it is possible to free up at least \$250 million in working capital for the U.S. corrugated industry by applying just-in-time principles to the mill/box plant relationship. The opportunity is there. The only question is: Do box makers have the commitment and perseverance to make it happen? ■

TABLE 2: Oversize trends in Scandinavia.

Machine	Size	% change in pieces/order 1985 vs 1980
Flexo folder gluer	<94 in.	-13
Flexo folder gluer	94-116 in.	-24
Flexo folder gluer	>116 in.	-22
Platen die cutter	<63 in.	-18
Platen die cutter	>63 in.	-16

WASTE-TO-ENERGY INCINERATION IS NO THREAT TO WASTEPAPER SUPPLY

Survey shows that secondary fiber supply to the paper industry will not be affected, but concern about government flow control remains

By **LISA NORTH**

In the March 1985 issue of *Pulp & Paper*, the results of a survey on the progress of resource recovery in all 50 states were published. (Resource recovery refers to the recovery of energy or materials from the waste stream.) As densely populated areas within the U.S. have begun running out of room for waste landfills and other concerns about possible groundwater contamination from landfills have surfaced, more waste-to-energy incinerators have started up, offering a solution to a persistent problem.

By incinerating waste, energy can be harnessed, and the total volume of solid waste is reduced significantly. However, the paper industry and others who make use of recyclables have voiced concern that materials recovery is also a viable solution to reducing the amount of waste going into landfills.

At the time of the original *Pulp & Paper* account, it seemed as though waste-to-energy incineration plants, and related government flow control regulations, might threaten future wastepaper supplies. Wastepaper users thought that potentially recyclable wastepaper and paperboard, which constituted approximately 37.1% of municipal solid waste (MSW) according to Franklin Associates Ltd., would be funneled into waste-to-energy plants for incineration.

However, two years later, most of that concern has dissipated. For this current report, another survey of all 50 states was done to determine the status of resource recovery programs in the U.S. today and the compatibility of energy recovery with wastepaper recovery.

CURRENT WASTE-TO-ENERGY SITUATION. Although it requires significant capital expenditure, waste-to-energy incineration is the most modern solution to the limited landfill situation facing the more populated areas of the U.S. Since the 1985 survey, 22 new waste-to-energy plants have started up, while three were shut down. Ta-

ble 1 contains the results of the 1987 survey, including the number of operating plants in each state and the number of future plants.

The future of waste-to-energy incineration plants was difficult for many public officials to predict. One reason for the uncertainty was the decrease in oil prices, which made the demand for other energy sources low. A second factor that may affect future decisions to construct plants is the recently released (August 1987) Environmental Protection Agency (EPA) report on air emissions from incinerators.

This EPA report outlines findings on hazardous air emissions which come from incineration plants. The combustion facilities will be responsible for ensuring that they are within the guidelines for safe air emissions. The cost of meeting such EPA regulations could become prohibitive for those cities considering waste-to-energy incineration plants.

In addition to the waste-to-energy plants, small modular plants are coming into use by the private sector. Private facilities with onsite incinerators take potentially recyclable materials straight into the incinerators, usually without any opportunity for material recovery.

Such use of waste-to-energy technology often occurs at hospitals and jails, but it is applicable to any large commercial or industrial operation. Fred Iannazzi, Andover International Inc., has attempted to bring this activity to the attention of the paper industry, which he feels should try to work with large generators of OCC (old corrugated containers) and old news in order to recover more of it.

FLOW CONTROL LEGISLATION. Flow control is an aspect of waste-to-energy incineration that is of greatest concern to wastepaper users. According to the American Paper Institute's (API) Rod Edwards, flow control ordinances are not being enforced and therefore are having little impact on the ability to recover paper.

Wastepaper users who offered their views on waste-to-energy incineration said that it presented a problem to them only when plants were oversized and that strict flow control had to be established to bring in enough waste to allow the plant to operate efficiently. According

Ms. North was a recent summer intern with Pulp & Paper from the Univ. of Puget Sound, Tacoma, Wash.

Legend: Plant capacity in tons per day (tpd)

- < 100
- 100-250
- 251-500
- ▲ 501-750
- 751-1000
- ★ > 1000

Scale of miles: 0 100 200 300 400 500

to Franklin Associates Ltd., flow control is defined as "the means by which solid waste can be directed to an energy recovery facility. The objective is to assure that a plant can be financed and will have adequate waste to operate efficiently."

Flow control ordinances vary in their attention to source separation. Some make no exception for recyclable materials, while others encourage or facilitate recycling. Table 1 includes a listing of states that have some flow control ordinances and shows whether or not recyclables (such as paper) are exempt from flow control.

Statewide flow control ordinances referred to in Table 1 give ownership of the waste to the city or county governments, who are then free to institute flow control. Currently, 11 states have legislation which addresses flow control and delegates the ability to establish it to the city or county governments. Cities in 13 other states have instituted local flow control in connection with their resource recovery facilities, although no state ordinance specifically addresses the issue.

Of the 11 states which allow local governments to enact flow control, nine of them include an exemption for recyclables (including paper): California, Connecticut, Florida, Georgia, Maine, New Jersey, Rhode Island, Utah, and Virginia. New Jersey and Rhode Island have mandatory recycling legislation (see sidebar on mandatory recycling).

How have these nine states incorporated recycling into their flow control legislation? The state ordinances for California, Florida, Maine, Minnesota, Utah, and Washington allow for local flow control to waste-to-energy plants not including that portion of the MSW that is recyclable. Connecticut is moving toward a mandatory recycling program and hopes to recycle 25% of the MSW by 1991. In Maryland, Montgomery County has instituted a policy of mandatory recycling of residential newspapers, which are collected and sold to Garden State Paper. State office buildings in Maryland are also recycling paper.

In Georgia and New York, according to state law, flow control must not hinder source separation or recycling

efforts. In the two areas of Oregon where flow control has been enacted, there is weekly or monthly curbside collection of recyclable materials. Pennsylvania operates curbside collection programs for newsprint and more than 350 drop sites for recyclables. In Vermont, only nonrecyclables go to waste-to-energy incinerators.

Overall, flow control has not grown into the "monster" that wastepaper consumers had feared it would. For the most part, city and state governments do not plan to get in the way of separation efforts.

THE WASTEPAPER MARKET. According to Edwards of the API, recent high tipping fees at landfills and waste-to-energy plants have provided an incentive to recycle, thereby increasing the supply of wastepaper. He also predicted a growing increase in wastepaper demand. According to API data, consumption of wastepaper at U.S. paper and paperboard mills rose from 16,850,055 tons in 1985 to 17,887,743 tons in 1986. Final figures for 1987 are not yet available, but a similar increase in consumption is expected. Approximately 200 U.S. mills rely exclusively on wastepaper products.

Another factor increasing the demand for wastepaper is the export market. API data showed an increase in wastepaper exports from 3,285,926 in 1985 to 3,748,711 in 1986. Nearly 5 million tons will be exported in 1987. Wastepaper being exported includes cardboard, newspapers, and assorted office paper.

WASTEPAPER MILLS AND DEALERS. The position of the paper industry has changed very little since the 1985 article on waste-to-energy. The industry is still supportive of waste-to-energy incineration as a means of resource recovery. However, the API, on behalf of the industry, has requested that state solid waste management plans address the issue of recycling. With nine of the eleven states that have flow control ordinances exempting recyclables from their flow controls, these requests seem to have been acknowledged, and the concern over flow control is diminishing.

The consensus among the five largest wastepaper-consuming paper companies was that waste-to-energy and recycling are compatible. Federal Paper Board Co., Fort Howard Paper Co., Garden State Paper Co., Jefferson Smurfit Corp., and Sonoco Products Co. were all asked if waste-to-energy incineration plants were inhibiting the wastepaper supply. The response was a unanimous "No." Blake Boyd Jr. of Sonoco expressed the feelings of many when he said that "we were very concerned at first but have discovered they (waste-to-energy plant operators) are usually willing to work with us."

Wastepaper dealers are relatively unconcerned about waste-to-energy plants. These operations would pose a threat only if incineration skyrocketed and no recycling efforts were allowed. Their worry is not that supply might be limited by flow control, but instead that supply will increase from mandatory recycling programs. ■

FIGURE 2: Revised outlook for paper burned in waste-to-energy plants.

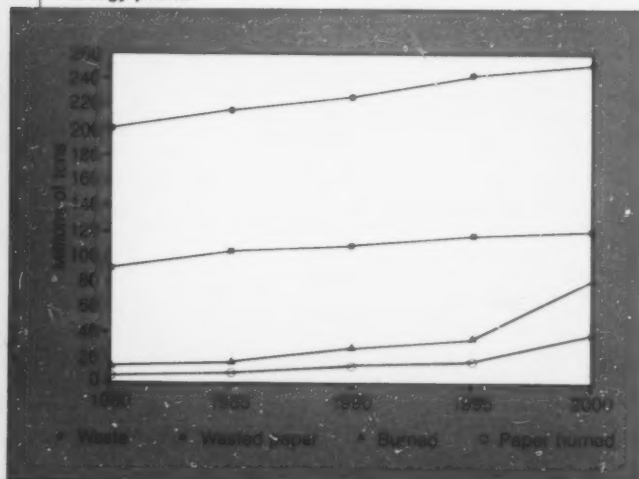


TABLE 1: Revised enumeration of waste-to-energy activity.

State	# Operating waste to energy plants	Total capacity of the plants (tpd)	Future plants (through Yr. 2000)	Statewide resource recovery plan	Year statewide plan enacted	Does plan address recycling?	Total MSW generated in state (tpd)	Wastewater consuming paper mills	Mills' wastewater consumption (tpd)	Towns with operating plants
Ala.	1	300	3	N	—	—	8,000	6	1,076	Tuscaloosa
Alaska	0	—	0	N	—	—	2,000	0	0	
Ariz.	1	25	0	N	—	—	8,750	1	750	(Hospital)
Ark.	2	150	n.a.	N	—	—	5,897	2	194	Batesville, N. Little Rock
Calif.	1	300	6	N	—	—	97,200	10	2,380	Commerce
Colo.	0	—	0	Y	1983	N	9,500	0	0	
Conn.	1	108	8	Y	1985	Y	7,293	2	300	Windham
Del.	1	1000	n.a.	Y	1976	N	1,848	0	0	Newcastle
Fla.	6	7,408	12	Y	1986	N	27,500	2	120	Dade Co., Miami, Mayport, Lakeland, Pinellas Co., Tampa
Ga.	1	500	0	N	—	—	12,000	4	1,025	Savannah
Hawaii	0	—	1	Y	1983	N	2,200	0	0	
Idaho	1	50	3	Y	1982	N	2,740	0	0	Heyburn
Ill.	1	1200	1	Y	1986	Y	30,680	3	267	Chicago
Ind.	0	—	1	Y	1980	Y	88,493	5	1,410	
Iowa	1	160	n.a.	Y	1987	N	5,205	1	50	Ames
Kans.	0	—	3	N	—	—	4,657	2	305	
Ky.	0	—	n.a.	N	—	—	8,767	1	225	
La.	0	—	1	Y	1980	—	—	4	370	
Maine	1	200	3	N	—	—	2,000	1	130	Auburn
Md.	3	2,050	3	Y	1977	Y	17,000	0	0	City of Baltimore, Smith Is., Baltimore Co.
Mass.	4	3,840	3	Y	1985	Y	16,400	4	345	Saugus, Haverhill, N. Andover, Pittsfield
Mich.	0	—	4	Y	1979	Y	32,000	9	1,945	
Minn.	7	1,585	11	Y	1984	Y	10,000	0	0	Thief River Falls, Rochester, Perham, Duluth, Savage, Red Wing (2)
Miss.	1	150	n.a.	N	—	—	3,200	2	173	Jackson Co.
Mo.	1	75	n.a.	N	—	—	n.a.	3	255	Ft. Leonard Wood
Mont.	1	75	3-5	Y	1976	N	1,400	0	0	Livingston/Park County
Nebr.	0	—	1	N	—	—	4,657	0	0	
Nev.	0	—	2	N	—	—	2,250	0	0	
N.H.	3	550	2	Y	1981	N	1,600	4	154	Claremont, Durham, Portsmouth
N.J.	2	200	17	Y	1985	Y	26,000	6	1,660	Ft. Dix, Atlantic Co.
N. Mex.	0	—	1	N	—	—	2,440	0	0	
N. Y.	8	6208	14	Y	1987	Y	48,000	11	1,410	Glen Cove, Westchester Co., Dutchess Co., Albany, Oneida Co., Oswego Co., Cuba, Niagara Falls
N.C.	1	200	3-5	N	—	—	16,000	1	25	
N.Dak.	0	—	0	N	—	—	1,305	0	0	
Ohio	2	4,200	n.a.	N	—	—	27,400	8	962	Columbus, Akron
Okla.	2	500	0	N	—	—	5,000	2	340	Miami, Tulsa
Ore.	1	550	1	N	—	SRP ¹	5,500	6	1,700	Salem
Pa.	2	770	10	Y	1982	Y	25,000	7	360	Harrisburg, Westmoreland Co.
R.I.	0	—	4	Y	1986	Y	2,740	0	0	
S.C.	1	225	1	N	—	—	6,125	3	1,340	Hampton Co.
S.Dak.	0	—	2	N	—	—	1,500	0	0	
Tenn.	4	1,420	0	N	—	—	n.a.	5	1,260	Nashville, Lewisburg, Gallatin, Dyersburg
Texas	8	430	6-7	Y	1983	N	41,000	4	845	Center, Carthage, Cleburne, Gatesville, Beto, Waxahachie, Houston, Huntsville
Utah	1	400	3	N	—	—	4,165	0	0	Davis Co.
Vt.	0	—	2	Y	1987	Y	975	2	59	
Va.	7	2900	10	N	—	—	—	5	1,030	Salem, Harrisonburg, Ft. Eustis, Norfolk, Hampton, Portsmouth, Alexandria
Wash.	0	—	3	Y	1970	Y	12,054	1	30	
W. Va.	0	—	1	N	—	—	4,200	0	0	
Wis.	3	455	25	Y	1986	Y	10,130	14	1,833	Barron Co., city of Waukesha, Madison
Wyo.	0	—	0	N	—	—	n.a.	0	0	

1. SRP = separate recycling program.

n.a. = not available; Y = yes; N = no; Co. = County.